

## CLAIMS

What is claimed is:

1. A method of detection, comprising:

- (a) receiving a signal representing a set of  $P$  symbols where  $P$  is a positive integer greater than 2;
- (b) jointly estimating a subset of  $P_1$  symbols of said set of  $P$  symbols where  $P_1$  is a positive integer;
- (c) after step (b), jointly estimating a subset of  $P_2$  symbols of said set of  $P$  symbols where  $P_2$  is a positive integer and wherein said subset of  $P_1$  symbols and said subset of  $P_2$  symbols are members of a partition of said set of  $P$  symbols and  $P_1 + P_2$  is greater than 2.

2. The method of claim 1, wherein:

- (a)  $P_1 = P_2 = P/2$ .

3. The method of claim 1, further comprising:

- (a) after step (c) of claim 1, for each  $m$  in the set  $\{3, \dots, M\}$ , jointly estimating a subset of  $P_m$  symbols of said set of  $P$  symbols where  $P_m$  is a positive integer and wherein said subset of  $P_m$  symbols is a member of a partition of said set of  $P$  symbols and  $P_1 + P_2 + \dots + P_M = P$  where  $M$  is a positive integer.

4. The method of claim 3, wherein:

- (a)  $P_1 = P_2 = \dots = P_M = P/M$ .

5. The method of claim 1, wherein:

- (a) said jointly estimating of step (b) of claim 1 includes a decision using  $P_1$ -vector of soft estimates  $\mathbf{F}_1 \mathbf{r}$  where  $\mathbf{r}$  is a  $Q$ -vector of said received signals of step (a) of claim 1 and  $\mathbf{F}_1$  is a  $P_1 \times Q$  matrix for zero-forcing estimation;

(b) said jointly estimating of step (c) of claim 1 includes a decision using  $P_2$ -vector of soft estimates  $\mathbf{F}_2 (\mathbf{r} - \mathbf{G}_1 \mathbf{s}^{(1)})$  where  $\mathbf{F}_2$  is a  $P_2 \times Q$  matrix for zero-forcing estimation,  $\mathbf{G}_1$  is a  $Q \times P_1$  matrix for zero-forcing feedback cancellation, and  $\mathbf{s}^{(1)}$  is the  $P_1$ -vector estimation result of step (b) of claim 1.

6. The method of claim 1, wherein:

(a) said jointly estimating of step (b) of claim 1 includes a decision using  $P_1$ -vector of soft estimates  $\mathbf{F}_1 \mathbf{r}$  where  $\mathbf{r}$  is a  $Q$ -vector of said received signals of step (a) of claim 1 and  $\mathbf{F}_1$  is a  $P_1 \times Q$  matrix for minimum mean square error estimation

(b) said jointly estimating of step (c) of claim 1 includes a decision using  $P_2$ -vector of soft estimates  $\mathbf{F}_2 (\mathbf{r} - \mathbf{G}_1 \mathbf{s}^{(1)})$  where  $\mathbf{F}_2$  is a  $P_2 \times Q$  matrix for minimum mean square error estimation,  $\mathbf{G}_1$  is a  $Q \times P_1$  matrix for zero-forcing feedback cancellation, and  $\mathbf{s}^{(1)}$  is the  $P_1$ -vector estimation result of step (b) of claim 1.

7. The method of claim 1, wherein:

(a) said jointly estimating of step (b) of claim 1 includes a decision using  $P_1$ -vector of soft estimates  $\mathbf{F}_1 \mathbf{r}$  where  $\mathbf{r}$  is a  $Q$ -vector of said received signals of step (a) of claim 1 and  $\mathbf{F}_1$  is a  $P_1 \times Q$  matrix for minimum mean square error estimation

(b) said jointly estimating of step (c) of claim 1 includes a decision using  $P_2$ -vector of soft estimates  $\mathbf{F}_2 (\mathbf{r} - \mathbf{G}_1 \mathbf{s}^{(1)})$  where  $\mathbf{F}_2$  is a  $P_2 \times Q$  matrix for minimum mean square error estimation including feedback error compensation,  $\mathbf{G}_1$  is a  $Q \times P_1$  matrix for zero-forcing feedback cancellation including feedback error compensation, and  $\mathbf{s}^{(1)}$  is the  $P_1$ -vector estimation result of step (b) of claim 1.

8. The method of claim 1, wherein:

(a) said subset of  $P_1$  symbols of step (b) of claim 1 is determined according to signal-to-interference-plus-noise ratios of said  $P$  symbols prior to a decision in said estimating.

9. The method of claim 1, wherein:

(a) said subset of  $P_1$  symbols of step (b) of claim 1 is determined according to projected signal-to-interference-plus-noise ratios of said  $P$  symbols after a decision in said estimating.

10. The method of claim 1, wherein:

(a) said jointly estimating of step (b) of claim 1 includes a maximum likelihood decision; and

(b) said jointly estimating of step (c) of claim 1 includes a maximum likelihood decision.

11. The method of claim 1, wherein:

(a) said jointly estimating of step (b) of claim 1 includes a soft decision; and

(b) said jointly estimating of step (c) of claim 1 includes a soft decision.

12. The method of claim 1, further comprising:

(a) jointly re-estimating said subset of  $P_1$  symbols using error compensation determined by said jointly estimating said subset of  $P_2$  symbols of step (c) of claim 1.